

**ALTERNATIVES**

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**SUMMARY OF CONCLUSIONS**

In this analysis of the Carrizo Energy Solar Farm (CESF), nine alternative project sites were examined, as well as several alternative generation technologies. The alternative sites would not substantially reduce or avoid significant impacts to Biological Resources and Visual Resources. Some of the alternative technologies could achieve most of the project objectives, but would likewise not substantially lessen or avoid environmental impacts.

The alternative sites considered in this Final Staff Assessment (FSA) are similar to the proposed project in size and land characteristics, and for the most part are located within reasonable proximity to transmission infrastructure. None of the sites, however, are considered to be superior to the applicant's proposed site. The Harper Lake site offers strong solar resources, but contains important biological habitat and visual impacts that could be significant. The Old Mine and Daggett-Soppeland sites, in close geographic proximity to Harper Lake, were not retained because of similar expected impacts and because they, as well as the Harper Lake site, would not interconnect to Pacific Gas and Electric's (PG&E) transmission system. The Lokern site is not in an area of high solar insolation and a lengthy transmission interconnection would be required. The South Carrizo Plain sites would have similar biological and visual impacts. The Antelope Plain site would pose similar to slightly greater visual impacts and somewhat reduced biological impacts. The North Carrizo Plain site could interfere with the same migration corridors as the proposed site and would likely pose significant visual impacts as well.

Alternative solar thermal technologies (parabolic trough, Stirling dish, and distributed tower power) were considered. As with the proposed Compact Linear Fresnel Reflector (CLFR) technology, these technologies would not generate air emissions although water use varies among the technologies. Given similar or greater acreage requirements, they would not lessen the environmental impacts associated with extensive land use. Solar photovoltaic (PV) facilities would likewise require extensive acreage, although rooftop PV could minimize land requirements. However, the combined rooftop PV potential in San Luis Obispo and Kern Counties in the year 2016 would be less than half of the generation potential of the proposed project.

Other generation technologies (wind, geothermal, biomass, tidal, wave, natural gas, and nuclear) were also examined as possible alternatives to the project. Geothermal, tidal, and wave alternatives are not applicable to the Carrizo Plain. Wind power is not considered a feasible alternative as the Carrizo Plain is not identified as a productive area for development of commercial wind power. Biomass would not be practical due to the need to transport biomass fuels from outside the area which would create significant and long-term traffic impacts. A natural gas plant would contribute to greenhouse gas

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emissions and would not meet the project's renewable generation objective. Finally, construction of new nuclear power plants is currently prohibited under California law.

Conservation and demand side management programs would likely not meet the state's growing electricity needs that could be served by the CESF. In addition, these programs would not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements. Staff also believes that the "no project" alternative is not superior to the proposed project. The "no project" scenario would likely delay development of renewable resources, and would lead to increased operation of existing plants, which use non-renewable technologies. Pacific Gas and Electric (PG&E) would not receive the 177 MW contribution to its renewable procurement requirement.

## INTRODUCTION

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This section considers potential alternatives to the construction and operation of the proposed CESF. The purpose of this alternatives analysis is to comply with state environmental laws by providing an analysis of a reasonable range of feasible alternative sites which could substantially reduce or avoid any potentially significant adverse impacts of the proposed project (Cal. Code Regs., tit. 14, §15126.6; Cal. Code Regs., tit. 20, §1765). This section discusses potentially significant impacts of the proposed project that were identified in various technical sections of this FSA and analyzes alternative sites and different technologies that may reduce or avoid those significant impacts.

This Alternatives section of the Final Staff Assessment (FSA) differs in a number of areas from the Alternatives section prepared as part of the Preliminary Staff Assessment (PSA). Additional alternatives are included for evaluation based on comments received on the PSA and on new information provided in the Renewable Energy Transmission Initiative (RETI) Phase IB and Phase 2A Reports released in December 2008 and June 2009, respectively. The alternatives include new site locations, a refinement in the location of alternatives identified in the PSA and a new discussion of rooftop solar potential. In addition, this Alternatives section reflects new information presented in other sections of this FSA that indicate that impacts previously considered to be significant could be reduced to less than significant levels through mitigation.

In cases where, based upon evidence presented at the final hearing, the Energy Commission identifies one or more viable alternatives that it determines meet the project objectives and avoid or substantially lessen one or more of any significant effects of the project, the Energy Commission is authorized to, among other things, deny certification of the proposed project based on the existence of the alternative(s). The Energy Commission does not have authority to require applicants to move proposed projects to different locations or to build alternative projects.

## **CALIFORNIA ENVIRONMENTAL QUALITY ACT CRITERIA**

Energy Commission siting regulations require the examination of the “feasibility of available site and facility alternatives to the Applicant’s proposal which substantially lessen the significant adverse impacts of the proposal on the environment” (Cal. Code Regs., tit. 20, § 1765).

In addition, the California Environmental Quality Act (CEQA) Guidelines require an evaluation of “a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project.” (Cal. Code Regs., tit. 14 § 15126.6(a). In addition, the analysis must address the “no project” alternative (Cal. Code Regs., tit. 14, § 15126.6(e)).

The range of alternatives is governed by the “rule of reason,” which requires consideration only of those alternatives necessary to permit informed decision-making and public participation. *CEQA Guidelines* state that an environmental document does not have to consider an alternative of which the effect cannot be reasonably ascertained and of which the implementation is remote and speculative (Cal. Code Regs., tit. 14, § 15126.6(f)(3)).

## **PROJECT DESCRIPTION AND SETTING**

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The CESF is a nominal 177 MW net solar thermal power plant that would use Compact Linear Fresnel Reflector technology. Ausra CA II, LLC (dba Carrizo Energy, LLC) and Pacific Gas and Electric (PG&E) had previously executed a Power Purchase Agreement (PPA). However, Ausra and PG&E mutually chose to withdraw the PPA that was pending approval by the California Public Utilities Commission, and negotiate another with more current provisions. The initial phase of the project is scheduled to be on-line during spring 2011 and full capacity and commercial operation is expected to begin in third quarter of 2012.

The CESF project would consist of a 640-acre plant and 380-acre construction laydown area. In addition to the solar components and generation equipment, the plant would require a groundwater well, raw water storage tank and supply line, access roads, offices, and maintenance facilities. A new double-circuit 230 kV overhead transmission line, approximately 850 feet in length, will interconnect the CESF switchyard to PG&E’s new loop-in switching station that would also be located within the CESF site along the northern project boundary. A 90-foot double circuit 230 kV line would tie PG&E’s switching station to the existing Morro Bay–Midway #1 230 kV line located immediately outside the northern project boundary and running west to Morro Bay Powerplant and east to Midway Substation. The loop-in switching station serves as the project’s point of interconnection and would reroute the Morro Bay–Midway #1 230 kV line through the switching station.

The solar field would consist of 195 CLFR solar concentrating lines, with dimensions 90 feet wide, 1,268 feet long, and 5 feet high. Each line would contain 10 rows divided into

four segments; the row-segments would be supported on hoops (8 feet in diameter) that rotate to track the sun based on its angle above the horizon. The solar concentrating lines focus heat directly on receivers (3 feet wide, 1,268 feet long, and 56 feet high), producing steam for collection by a piping system. The steam would be delivered to eight steam drums located in the solar field and to two steam drums in the power block. The steam would then flow to two steam turbine generators that could each generate a gross capacity of 93 MW at full load with average ambient conditions. With plant auxiliary loads, the net plant capacity would be 177 MW. Additionally, during construction, reflector frames would be manufactured in a temporary onsite manufacturing building.

The CESF would be located in the South Carrizo Plain in eastern San Luis Obispo County, near the towns of Simmler and California Valley. The Temblor Range and the Los Padres National Forest lie to the east and surround the northwest to southeast running Plain, which is home to the endangered San Joaquin Valley kit fox (*Vulpes macrotis mutica*) and to the reintroduced pronghorn antelope (*Antilocarpa americana*) and tule elk (*Cervus elaphus nannodes*). The proposed solar plant site is privately-owned, unincorporated land zoned for agriculture; San Luis Obispo County permits electrical generation in agricultural zones. The site lies on disturbed ranchland bisected by SR-58, and is generally flat, with a gentle slope to the southeast. The Carrizo Plain National Monument – 6.5 miles to the southeast – contains one of California’s largest remaining native grasslands and the 3,000-acre, alkaline Soda Lake. Carriza Creek crosses the CESF project laydown area and eventually drains to the lake (CESF 2007a, Section 3).

## **DETERMINING THE SCOPE OF THE ALTERNATIVES ANALYSIS**

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The purpose of staff’s alternatives analysis is to identify the potential significant impacts of the CESF project and then focus on alternatives that are capable of reducing or avoiding these impacts.

To prepare this alternative analysis, the staff used the methodology summarized below:

- Describe the basic objectives of the project.
- Identify any potential significant environmental impacts of the project.
- Identify and evaluate alternative locations or site facility arrangements to determine whether the environmental impacts of the alternatives are the same, better, or worse than the proposed project.
- Identify and evaluate technology alternatives to the project which would mitigate impacts.
- Evaluate the impacts of not constructing the project in order to compare the “no project” alternative to the project as proposed.

## BASIC OBJECTIVES OF THE PROJECT

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Project objectives were defined by the applicant in the CESF AFC and are presented directly below. According to the AFC, the applicant chose the proposed site to satisfy the following requirements (CESF 2007a, page 2-2):

- To comply with provisions of the Power Purchase Agreement, and develop a project with the potential to achieve an initial commercial on-line date in 2011;
- To safely and economically provide an efficient, reliable, and environmentally sound solar power generating facility in San Luis Obispo County capable of selling competitively priced renewable energy consistent with the needs of the surrounding areas, as well as provide additional generating capacity for the State and region as a whole;
- To minimize infrastructure needs and reduce environmental impacts by locating the plant near existing infrastructure, including PG&E transmission lines and substation, and an adequate water supply without requiring significant modifications to the regional system;
- To avoid siting the plant in areas that are highly pristine or biologically sensitive;
- To site the facility in areas with high solar energy potential and consistent with existing land use plans which call for renewable energy development; and
- To assist California in repositioning its generation asset portfolio to use more renewable energy in conformance with State Policy, including the policy objectives set forth in Senate Bill (SB) 1078 (California Renewable Portfolio Standard Program) and Assembly Bill (AB) 32 (California Global Warming Solutions Act of 2006).

Staff then assesses these project objectives to ensure that they are not inappropriately narrow, which could impede the development of a reasonable range of alternatives for the project. Staff specifically includes the underlying purpose of the project. (Cal. Code Regs., tit. 14 § 15124(b). Having taken into consideration the six objectives set forth by Ausra in its AFC, the Energy Commission identified the following three basic project objectives. These objectives are used to evaluate the viability of alternatives in accordance with CEQA.

- To safely and economically construct and operate a mid- sized (150-200 MW) solar power generating facility in California that will meet regional and state-wide needs.
- To site the facility in areas with high solar energy potential (comparable to solar insolation at the CESF site) and consistent with local land use plans, and where it can be interconnected to PG&E's transmission system without substantial upgrade or cost.
- To achieve commercial operation of the first phase of the project by 2011 and to achieve full commercial operation by 2012. (Staff has updated the commercial operation dates based on the current permitting and construction schedule.)

## POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PROJECT

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Staff has identified the following significant impacts resulting from construction and operation of the CESF:

- **Biological Resources.** The CESF would impact 1,020 acres of dry farmed land and disturbed areas that provide habitat for multiple protected wildland species. The operation of the CESF would block or impair wildlife corridors and cause a loss of habitat that would result in impacts to a number of species, including the federally-endangered and state-threatened San Joaquin kit fox (*Vulpes macrotis mutica*), and the rare native games species pronghorn (*Antilocapra Americana*) and tule elk (*Cervus elaphus*). Habitat loss and wildlife corridor impacts have the potential to be cumulatively significant. The adequacy of proposed or potential mitigation hinges on guidance and understanding of the proposed project's impacts provided by the wildlife corridor study currently underway. This study will allow assessment of the connectivity impacts of the CESF, cumulative impacts from additional solar development, and the effectiveness of potential mitigation measures.
- **Visual Resources.** The operation of the CESF as proposed would introduce a direct significant impact, and contribute to a cumulative aesthetic impact under CEQA, and may be inconsistent with applicable LORS pertaining to aesthetics, or preservation and protection of sensitive visual resources. The project would cause a significant transformation to the Carrizo Plain, changing current rural farm land to industrial use and degrading overall visual quality. The project would be highly visible to several residences and to roadway users within one mile.

Although not identified as significant impacts due to mitigation that would be imposed by the Energy Commission, water resource, noise, and transportation issues were of concern to the community and are also considered in this analysis. The significant impacts posed by the CESF are discussed in detail in the **Biological Resources, and Visual Resources** sections in the FSA.

## SITE ALTERNATIVES TO THE PROJECT

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This section evaluates the alternative sites identified by CESF and other site possibilities identified by staff or the public. It also describes the many factors that were considered in identifying alternative sites.

### SCREENING CRITERIA

A variety of screening criteria were used to determine whether another site location would be evaluated as an alternative to the CESF.

- Staff reviewed the three project objectives to determine whether an alternative site would feasibly attain most of the objectives.
- Staff analyzed solar insolation maps to determine if there was solar insolation comparable to the Carrizo Plain in neighboring areas.

- Staff consulted the California Independent System Operator generation queue to determine if other solar applicants had identified locations in the Carrizo Plain and neighboring areas that would be suitable for a solar thermal project.
- Staff reviewed the Topaz Solar Farm (TSF) and California Valley Solar Ranch (CVSR) project boundaries to determine what land was not within these project footprints. The project footprints of both sites have changed over time.
- Staff reviewed the Renewable Energy Transmission Initiative (RETI) Phase 1B and Phase 2A reports to determine the location of competitive renewable energy zones (CREZs) and potential solar projects. The RETI reports evaluate and rank potential renewable energy sites within California based on certain economic and environmental criteria.
- Staff evaluated whether there was high voltage transmission infrastructure (e.g., a 230 kV line and substation) within a reasonable distance of an alternative site. Lengthy transmission connections would increase the potential for environmental impacts.
- Staff reviewed kit fox recovery areas, habitat conservation plans and planning criteria (e.g., San Luis Obispo County kit fox mitigation ratios) to determine locations that might avoid or lessen impacts to kit fox, pronghorn antelope and tule elk.
- Staff reviewed land use information (maps, zoning information, agricultural use) to determine whether there were constraints (e.g., Williamson Act land) associated with an alternative site. Staff looked for land that would be large enough (e.g., 640 acres) to accommodate the proposed project, was relatively flat and generally available. The proximity to receptors was also considered.
- Staff reviewed public comments regarding potential alternative sites.

Using information derived from the above, **ALTERNATIVES Figure 1** identifies constraints affecting identification of alternative sites. The proposed locations of the 4,100-acre TSF (that would be sited within a 5,300-acre total study area) north, west and east of the CESF and the 4,365-acre CVSR south and east of CESF limit the availability of alternative sites in the South Carrizo Plain. Areas in San Luis Obispo and western Kern counties where solar insolation would be equivalent to the CESF site are also limited due to fog and cloud cover prevalent along the coast and in the Central Valley.

## **SITES IDENTIFIED BY APPLICANT**

Four alternative sites were identified by the Applicant. Very limited information and analysis was provided in the AFC for each site. The sites are as follows:

**Daggett – Soppeland Alternative Site.** This site is east of Barstow in San Bernardino County, along the I-15 corridor. It was eliminated by the Applicant because it would use federal lands, which would require compliance with the National Environmental Protection Act. Environmental permitting timeframes would cause the project to exceed the 2011 on-line date. The Applicant also indicated that the site is not in the CAISO

queue (CESF 2007a, page 4-1). Staff analysis, however, found that 98 percent of the site, as identified by the Applicant (at the March 12, 2008 Data Response and Issue Resolution Workshop), is privately-owned.

**Harper Lake Alternative Site.** This site near Harper Dry Lake (west of Barstow) is privately owned by Harper Lake LLC which intends to develop five 100 MW solar thermal plants by 2010 (Harper Lake LLC, 2006). The site was eliminated by the Applicant due to excessive costs and also because it is not in the CAISO queue (CESF 2007a, page 4-2).

**Old Mine Alternative Site.** This site, near Calico Ghost Town in San Bernardino County, is owned by BLM and private landowners. The Applicant eliminated the site because it is not in the CAISO queue (CESF 2007a, page 4-2).

**Lokern Alternative Site.** The Applicant identified a broad region near where SR-58 and I-5 merge in Kern County but did not conduct a more detailed analysis of any specific sites. Staff reviewed the general region and identified an area that is not considered kit fox recovery area and is located north of ecological preserves found in the Lokern area. The area (generally Township 28S, Ranges 21E and 22E) parallels I-5 between SR-58 and SR-46 and extends as far west as SR-33 near 7<sup>th</sup> Standard Road.

## **SITES IDENTIFIED BY STAFF**

The staff-identified alternatives include the following:

**South Carrizo Plain Alternative Site A.** Staff identified land 0.5 miles to approximately 1.5 miles north of the intersection of Bitterwater Road and SR-58 and immediately north of PG&E's Morro Bay-Midway 230 kV transmission line (roughly Township 29S, Range 18E, Section 19). This alternative site location would be further removed from SR-58 but would be partially within the revised TSF footprint. Residences abut Section 19 to the north and west. The site is not a Williamson Act conservation area.

**South Carrizo Plain Alternative Site B.** In response to public comment, staff identified another location approximately 4 miles north of the Bitterwater Road-SR 58 intersection (Township 29S, Range 17E, Section 1). The site is at a greater distance from SR-58 and in an area of larger land parcels. This location is west of Bitterwater Road and is not within the original or current footprint of the proposed TSF footprint, which is south-east of South Carrizo Plain Alternative Site B. Approximately 2 to 3 miles of new transmission line would need to be constructed. The closest receptor would be 0.5 miles to the southwest. The site is not a Williamson Act conservation area.

**South Carrizo Plain Alternative Site C.** In response to public comment, staff identified land in the vicinity of Township 29S, Range 18E, Section 35. This undeveloped area is located immediately north of SR-58. The Carrizo Plain Community Hall is directly across from the southwest corner of Section 35. The closest residences are about 0.4 miles to the east and 0.7 miles to the west along SR-58. The Carrisa Plains Elementary School is one mile away. The site is not a Williamson Act conservation area. Approximately one mile of new transmission line would be required.



**Antelope Plain Alternative Site D.** Also in response to public comment, staff reviewed land in the Antelope Plain, in northwest Kern County. There are two areas in northwest Kern County that appear to have solar insolation comparable to that in the South Carrizo Plain. One location straddles the Kern County/Kings County border and the second is near the intersection of CA-46 and Kecks Road. Staff also reviewed land east of SR-33 in the vicinity of the Arco Substation (located midway between SR-33 and the California Aqueduct, and immediately south of the Kings County border), which connects to a PG&E 230 kV line. Staff selected the CA-46/Kecks Road location (Township 26S, Range 18E, Section 9) as Antelope Plain Alternative Site D, given that it met solar insolation requirements and had fewer biological constraints. The land use is largely agricultural and there are few residences in the area. Parcels in this area (including Site D) are Williamson Act conservation areas. The nearest transmission line interconnection would be approximately 10 miles away at the Arco Substation.

**North Carrizo Plain Alternative Site E.** The RETI Phase 1B Report identified the North Carrizo Plain (Cholame Valley) as a potential competitive renewable energy zone. The valley straddles southeast Monterey County and northeast San Luis Obispo County, and is accessed by Cholame Valley Road, which is proximate to the intersection of SR-41 and SR-46. The Diablo-Gates 500 kV transmission line crosses the north end of the valley. Parcels are zoned for agriculture and are generally 40 to 160 acres in size. There are no residences in the area. The North Carrizo Alternative Site E is located east of Cholame Valley Road in the vicinity of Township 25S, Range 15E, Section 2. The site is not a Williamson Act conservation area. Transmission interconnection length would be on the order of three to five miles.

**ALTERNATIVES Figure 2** identifies the approximate locations of the alternative sites identified by the Applicant and by staff. **ALTERNATIVES Figure 3** shows the locations of the staff-identified alternatives with respect to constraints limiting the availability of alternative sites in the region.

## **SITES NOT CARRIED FORWARD FOR FURTHER EVALUATION**

Staff rejected three of the four site locations identified by the applicant. These sites and the reasons for rejection are as follows:

**Old Mine Alternative Site & Daggett – Soppeland Alternative Site.** As discussed below, staff has identified the Harper Lake area as a potential alternative site location. Since the Old Mine and Daggett – Soppeland sites are also in the Mojave Desert in relatively close geographic proximity to the Harper Lake site and are in Southern California Edison (SCE) territory, they are expected to have similar environmental impacts and would not directly interconnect to PG&E's transmission system. Therefore, these sites are not expected to provide additional environmental benefits over the Harper Lake site, would require additional transmission lines/upgrades, and are not considered further.

**Lokern Alternative Site.** The industrial Lokern region in the vicinity of SR-58 and SR-33 includes numerous oil fields, natural gas plants, a hazardous materials storage facility, and the Morro Bay-Midway transmission line to the south. SR-33 runs along the

axis of the Midway-Sunset oil field for much of the field's 20-mile length. In addition to active oil fields, the area contains several ecological reserves that have been created as biological mitigation for infrastructure projects located elsewhere.

The area identified by staff is disturbed land and not within kit fox recovery area. Approximately 10 miles or more of transmission connection would be required for a site in this area. Compatibility with newly created ecological reserves may be of concern and new transmission corridors would be needed to avoid these reserves. In reference to **Alternatives Figure 3**, solar insolation is not comparable to the CESF site (NREL, 2008). Although this location would potentially lessen impacts to visual, biological, traffic and noise associated with the power plant site, this area experiences a higher incidence of fog and cloud cover than the proposed site, reducing the available solar insolation. There could also be significant impacts associated with establishing a new 10-mile transmission line corridor. The Lokern site therefore does not meet the project objectives to site the project in an area with comparable solar insolation as CESF and the project could not reasonably be developed to produce power by 2011 and 2012. Therefore, the Lokern Alternative site is not retained for further consideration.

## **SITES CARRIED FORWARD FOR FURTHER EVALUATION**

Staff is considering the alternative sites discussed below. For all alternative sites, transmission interconnection and permitting timeframes would push the project beyond the 2011 on-line schedule. Additionally, the Applicant does not have site control at these locations.

**Harper Lake Alternative Site.** Staff requested that the applicant identify specific parcels that it considered in relation to the Harper Lake site. Of the township sections the Applicant identified at the March 12 Data Response Workshop, Township 11N, Range 05W, Section 25 and adjacent Section 36 appear suitable. Solar thermal facilities (SEGS VIII and IX) are currently operating to the north and northeast (Harper Lake 2006). A new facility (Mojave Solar One) is proposed in close proximity to these two existing facilities.

According to Solargenix (2005), the Harper Lake site receives greater solar insolation (7.65 kWh/m<sup>2</sup>-day) than the Carrizo Plain (6.72 kWh/m<sup>2</sup>-day). The Kramer substation is located 10 miles to the southwest and would be the presumed point of interconnection. (Existing Harper Lake solar facilities connect to the Kramer substation). Development of additional solar facilities at the site would require the construction of new transmission lines to deliver new solar generation from Kramer substation to load centers.

Staff has identified the environmental impacts that would likely result from constructing the CESF at the Harper Lake site. Staff's analysis identifies whether the Harper Lake site could substantially reduce or avoid any potentially significant adverse impacts of the proposed project.

### **Environmental impacts:**

- **Biological Resources:** Both the CESF site and the Harper Lake site are disturbed - the CESF would be situated on disturbed ranchland and Harper Lake on a former

alfalfa ranch (CESF 2007a). The CESF site is located in a pronghorn antelope migration corridor, and provides habitat for the San Joaquin kit fox and potentially for tule elk. The Harper Lake site may serve as important habitat for the state threatened Mojave ground squirrel (*Spermophilus mohavensis*) and desert tortoise (*Gopherus agassizii*) (California Natural Diversity Database [CNDDB], 2009). A number of very large solar energy facilities have been proposed in the Mojave Desert, raising concerns about the destruction of the fragile desert environment and impacts to sensitive species. The Desert Tortoise Preserve Committee (DTPC) has identified that a proposed energy park in the Harper Lake area would cause impacts to desert tortoise from increased habitat destruction, road kills and raven predation (DTPC, 2006). Based on the above, potentially significant impacts to biological resources could result from a 1,000 acre solar facility (operating site plus laydown area) sited at Harper Lake.

- **Visual:** The CESF would have significant visual impacts, changing the rural agricultural character of the Carrizo Plain. The Harper Lake site would be less visible to travelers on SR-58, which is approximately 5 miles south of the site. However, new solar development in addition to the existing SEGS VIII and IX facilities could contribute to the further industrialization of a remote area. Analyses associated with other solar facilities proposed in the desert environment have identified impacts to visual resources. Energy Commission staff has determined that the Ivanpah Solar Electric Generating System that has been proposed in the California desert 4.5 miles southwest of Primm, Nevada, in combination with foreseeable future projects, could have significant cumulative visual impacts.
- **Noise:** Noise impacts of the CESF on nearby rural residences, particularly on the northern side of the site, would be mitigated to less than significant levels. The area surrounding Harper Lake is undeveloped, providing for less than significant noise impacts. The town of Lockhart (one mile to the east of the Harper Lake site) is abandoned, although one or two residences remain in the area. No noise impacts would be expected at the Harper Lake Alternative Site.
- **Traffic and Transportation:** SR-58 would provide access to both sites. The segment between I-5 and the CESF site is narrow and limited as to truck traffic. The segment between Barstow and Bakersfield, which would provide the main access to the Harper Lake site, is a truck route, providing for less adverse traffic impacts than the SR-58 segment running west from I-5 to the CESF site. Road improvements may be needed from SR-58 to the Harper Lake site. Overall, while traffic and transportation impacts would be mitigated to less-than-significant levels at the CESF, traffic and transportation impacts appear to be less at the Harper Lake Alternative Site.
- **Water Resources:** The Carrizo Plain groundwater basin contains 400,000 acre feet (CESF 2007a), and the water supply is constrained. However, catch basins located on the CESF site, in conjunction with reduced evapo-transpiration from land use changes, would allow for recharge of water equivalent to or greater than that used by the project. The Harper Lake Alternative Site is situated above an underground aquifer estimated at 6.9 million acre feet (Harper Lake, LLC 2006) and the water

supply is considered excellent (Solargenix 2005). The Harper Lake site is well removed from a wetlands complex located at the edge of Harper Lake, and surface discharge/runoff from a project at this location would likely not affect the wetlands. Thus, neither site would create water resource impacts.

- **Other issue areas** (air quality, geology and soils, worker safety, etc.): Environmental impacts for Harper Lake would likely be similar to that of the CESF.

**South Carrizo Plain Alternative Site A.** Staff has identified the environmental impacts that would likely result from constructing the CESF at South Carrizo Plain Alternative Site A. Staff's analysis identifies whether this site could substantially reduce or avoid any potentially significant adverse impacts of the proposed project.

#### **Environmental impacts:**

- **Biological resources:** As with the proposed site, this site may also interfere with pronghorn antelope movement as well as San Joaquin kit fox and tule elk habitat. Both the proposed site and South Carrizo Plain Alternative Site A are habitat for kit fox, and have connectivity function for kit fox between the Carrizo Plain core population and other important kit fox populations. Similar impacts to biological resources are expected.
- **Visual:** While fewer residences may have a direct view of the project if located at Bitterwater Road Alternative Site A, a solar facility would likewise industrialize what is currently farmland. At this site, visual impacts would be similar to the proposed site.
- **Noise:** Scattered rural residences are found in the vicinity of this alternative resulting in noise impacts that would be comparable or only slightly less than at the CESF site, depending on location of the power block.
- **Traffic:** SR 58 is expected to be the main access route for South Carrizo Plain Alternative Site A, similar to the proposed site. Impacts from construction truck traffic are generally expected to be similar.
- **Water resources:** As discussed above, the proposed project would not increase withdrawal to the Carrizo Plain groundwater basin. Assuming similar recharge at this site, no water supply impacts would likewise be expected.
- **Other issue areas** (air quality, geology and soils, worker safety, etc.): Other environmental impacts for South Carrizo Plain Alternative Site A would likely be similar to that of the proposed site.

**South Carrizo Plain Alternative Site B.** Staff has identified the environmental impacts that would likely result from constructing the CESF at the South Carrizo Plain Alternative Site B location. Staff's analysis identifies whether this site could substantially reduce or avoid any potentially significant adverse impacts of the proposed project.

### Environmental impacts:

- **Biological resources:** As with the proposed site, this site may also interfere with pronghorn antelope movement as well as San Joaquin kit fox and tule elk habitat. Both the proposed site and South Carrizo Plain Alternative Site B are habitat for kit fox, and have connectivity function for kit fox between the Carrizo Plain core population and other important kit fox populations.
- **Visual:** Given the northern site's distance from Hwy 58 and the presence of fewer residences, the project would be less visible at this location. However, a significant transformation of rural farm land to industrial use at the South Carrizo Plain Alternative Site B would occur, similar to that of the CESF.
- **Noise:** Noise impacts would likely be reduced at the South Carrizo Plain Alternative Site B location given that parcel sizes are much larger, reducing the number and proximity of receptors.
- **Traffic:** SR 58 is expected to be the main access route for South Carrizo Plain Alternative Site B, similar to the proposed site. The location of South Carrizo Plain Alternative Site B four miles north on Bitterwater Road would require additional truck traffic on a more rural road. (The Applicant has indicated that Bitterwater Road would only be used as a truck route to the CESF for time-critical project loads in the event SR-58 is closed.) San Luis Obispo County has indicated that Bitterwater Road would not be able to handle the physical duress of a large number of regular truck trips. A project at this location would have greater traffic impacts.
- **Water resources:** the proposed project would not increase withdrawal to the Carrizo Plain groundwater basin. Assuming similar recharge at this site, no water supply impacts would likewise be expected.
- **Other issue areas** (air quality, geology and soils, worker safety, etc.): Other environmental impacts for South Carrizo Plain Alternative Site B would likely be similar to that of the proposed site.

**South Carrizo Plain Alternative Site C.** Staff has identified the environmental impacts that would likely result from constructing the CESF at the South Carrizo Plain Alternative Site C location. Staff's analysis identifies whether this site could substantially reduce or avoid any potentially significant adverse impacts of the proposed project.

### Environmental impacts:

- **Biological resources:** As with the proposed site, this site may also interfere with pronghorn antelope movement as well as San Joaquin kit fox and tule elk habitat. Both the proposed site and South Carrizo Plain Alternative Site C are habitat for kit fox, and have connectivity function for kit fox between the Carrizo Plain core population and other important kit fox populations. South Carrizo Plain Alternative Site C would have a slightly greater contribution to connectivity impacts than the proposed project site due to the location of South Carrizo Alternative Site C in the

flatland portion of the valley, between the proposed footprints of the TSF and the CVSR projects. South Carrizo Alternative Site C would contribute to a greater extent in reducing the width of the lands available for wildlife movement in the pinch point between the TSF and CVSR projects. Slightly greater impacts to biological resources are expected.

- **Visual:** A project at South Carrizo Plain Alternative Site C would be adjacent to SR-58 and very visible to travelers entering the Carrizo Plain. A significant transformation of rural farm land to industrial use at the South Carrizo Plain Alternative Site C would lead to visual impacts similar to that of the CESF.
- **Noise:** Noise impacts would likely be reduced at the South Carrizo Plain Alternative Site C location given that there are fewer residences in the area.
- **Traffic:** SR 58 is expected to be the main access route for South Carrizo Plain Alternative Site C, similar to the proposed site. Impacts from construction truck traffic are thus expected to be similar, although there would be fewer vehicles traveling in the vicinity of the Carrisa Plains School.
- **Water resources:** The proposed project would not increase withdrawal to the Carrizo Plain groundwater basin. Assuming similar recharge at this site, no water supply impacts would likewise be expected.
- **Other issue areas** (air quality, geology and soils, worker safety, etc.): Other environmental impacts for South Carrizo Plain Alternative Site C would likely be similar to that of the proposed site.

**Antelope Plain Alternative Site D.** Staff has identified the environmental impacts that would likely result from constructing the CESF at the Antelope Plain Alternative Site D. Staff's analysis identifies whether this site could substantially reduce or avoid any potentially significant adverse impacts of the proposed project.

#### **Environmental impacts:**

- **Biological Resources:** The endangered species consisting of blunt-nosed leopard lizard (*Gambelia sila*), burrowing owl (*Athene cunicularia*), and San Joaquin kit fox are found in the area (CNDDB, 2009). As the Antelope Plain Alternative Site D has been utilized as irrigated row crops, the likelihood of additional impacts to blunt-nosed leopard lizard is reduced. The San Joaquin antelope squirrel (*Ammospermophilus nelsoni*) also could occur in the area, and is considered threatened by the California Department of Fish and Game (CDFG) and a species of concern by the U.S. Fish and Wildlife (USFWS) due to loss of habitat. This site is located on land considered as linkage for kit fox recovery areas, and kit fox connectivity impacts would still be of concern at the Antelope Plain Alternative Site D. However, the potential for direct and cumulative impacts to connectivity for kit fox is lower than the proposed CESF project site due to the lack of additional proposed solar projects and topographic constraints in the vicinity of Antelope Plain Alternative Site D. In reference to **Alternatives Figure 3**, the site is not within red or green zones (areas for conservation) in Kern County's Valley Floor Habitat Conservation Plan (HCP). The HCP aims to conserve 90 percent and 75 percent, respectively, of

existing natural lands in these zones. Impacts to biological resources would be reduced compared to the proposed site.

- **Visual:** A solar facility at the Antelope Plain Alternative Site D would be visible to travelers along SR-46. Land use in this area is agricultural. A significant transformation of rural farm land to industrial use at this site would lead to visual impacts similar to that of the CESF. Although there are fewer residences at this location, there would be more viewers traveling on SR-46 as compared to SR-58 in the vicinity of the CESF. Peak hour traffic counts for the two locations are 800 (SR-46 at Keck's Road) and 60 (SR-58 at Soda Lake Road) (California Department of Transportation 2008).
- **Noise:** With no residences or other sensitive receptors in the immediate area of this site, noise impacts from Antelope Plain Alternative Site D would be reduced.
- **Traffic and Transportation:** SR-46 traverses the Antelope Plain and connects to I-5. This route would accommodate truck traffic, thus reducing traffic impacts during construction compared to the proposed project.
- **Water Resources:** The Antelope Plain overlays the 3,040 square mile Kern County subbasin of the San Joaquin Valley groundwater basin. The subbasin's total water storage is estimated at 40 million acre feet (DWR 2006). As with the proposed site, no impacts to water resources would be expected if catch basins are used to recharge the water used by the project.
- **Other issue areas** (air quality, geology and soils, worker safety, etc.): Other environmental impacts for Antelope Plain Alternative Site D would likely be similar to that of the proposed site.

**North Carrizo Plain Alternative Site E.** Staff has identified the environmental impacts that would likely result from constructing the CESF at North Carrizo Plain Alternative Site E. Staff's analysis identifies whether this site could substantially reduce or avoid any potentially significant adverse impacts of the proposed project.

#### **Environmental impacts:**

- **Biological Resources.** Although this area is not located within USFWS kit fox recovery areas, an indication of the North Carrizo Plain Alternative Site E's value as kit fox habitat is that San Luis Obispo County had previously designated the highest mitigation ratio (4:1) for kit fox at this location for a project less than 40 acres. The North Carrizo Plain Alternative Site E would have limited impacts to tule elk, as that herd stays in the mountains/hills to the west. Pronghorn antelope do occur in the area and would be impacted. In comments on the PSA, the California Department of Fish and Game noted that: "Maintaining connectivity between this group [at Project site], the Carrizo Plain National Monument groups, and the Cholame Valley group will be essential to maintaining the overall San Luis Obispo County pronghorn population" (CDFG 2008). Additionally, construction of a solar facility at this site would likely result in impacts to, and loss of, sensitive Valley Sink Scrub habitat. Similar impacts to biological resources are expected as with the proposed CESF, particularly to kit fox and pronghorn.

- **Visual:** There are limited residences at this location thereby reducing the direct view of the project if located at North Carrizo Plain Alternative Site E. However, a solar facility at this location would industrialize what is currently farmland. Although there are fewer residences at this location, there would be more viewers traveling on SR-46 as compared to SR-58 in the vicinity of the CESF. Peak hour traffic counts for the two locations are 1,600 (SR-46 at Cholame) and 60 (SR-58 at Soda Lake Road). At this site, visual impacts would be somewhat greater than the proposed site.
- **Noise.** There are fewer nearby residences at this location; therefore noise impacts are expected to be reduced in comparison to the CESF site.
- **Traffic and Transportation:** The North Carrizo Plain Alternative Site E is located very close to the intersection of SR-41 and SR-46. Both routes are generally flatter and straighter than SR-58, thus reducing traffic impacts during construction compared to the proposed project.
- **Water Resources:** Cholame Creek and its tributaries drain the valley southeastward. The direction of groundwater flows is similar. Groundwater discharges to the surface near the intersection of SR-41 and SR-46, creating a flood hazard around Cholame Valley Road. Avoidance of Cholame Creek and the area of flooding would be required at this site. As with the proposed site, no impacts to water resources would be expected if catch basins are used to recharge the water equivalent to that used by the project.
- **Other issue areas** (air quality, geology and soils, worker safety, etc.): Other environmental impacts for North Carrizo Plain Alternative Site E would likely be similar to that of the proposed site.

Overall, the six alternatives evaluated above – Harper Lake Alternative Site, South Carrizo Plain Alternative Sites A, B and C, Antelope Plain Alternative Site D and North Carrizo Alternative Site E – offer some advantages and disadvantages over the CESF site. **ALTERNATIVES Table 1** compares the environmental impacts of the various alternative sites to impacts from the proposed CESF.



**ALTERNATIVES Table 1**  
**Comparison of Impacts of Alternatives to the Proposed CESF\***

	<b>Harper Lake Site</b>	<b>South Carrizo Plain Alternative Site A</b>	<b>South Carrizo Plain Alternative Site B</b>	<b>South Carrizo Plain Alternative Site C</b>	<b>Antelope Plain Alternative Site D</b>	<b>North Carrizo Plain Alternative Site E</b>
<b>Environmental Assessment</b>						
Biological Resources – SIGNIFANCT IMPACT	Similar to proposed site	Similar to proposed site	Similar to proposed site	Greater than proposed site	Less than proposed site	Similar to proposed site
Land Use	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site
Noise and Vibration	Less than proposed site	Similar to proposed site	Less than proposed site	Less than proposed site	Less than proposed site	Less than proposed site
Soil and Water Resources	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site
Traffic and Transportation	Less than proposed site	Similar to proposed site	Greater than proposed site	Similar to proposed site	Less than proposed site	Less than proposed site
Visual Resources – UNMITIGABLE SIGNIFICANT IMPACT	Similar to proposed site but fewer viewers	Similar to proposed site	Similar to proposed site but fewer viewers	Similar to proposed site	Greater than proposed site due to more viewers	Greater than proposed site due to more viewers
<b>Engineering Assessment</b>						
Transmission System Infrastructure (miles of transmission line)	Greater than proposed site (10 miles)	Similar to proposed site	Greater than proposed site (3 miles)	Similar to proposed site	Greater than proposed site (10 miles)	Greater than proposed site (3-5 miles)

	<b>Harper Lake Site</b>	<b>South Carrizo Plain Alternative Site A</b>	<b>South Carrizo Plain Alternative Site B</b>	<b>South Carrizo Plain Alternative Site C</b>	<b>Antelope Plain Alternative Site D</b>	<b>North Carrizo Plain Alternative Site E</b>
Solar Insolation	Stronger than proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site	Similar to proposed site

\*Shaded cells identify impacts greater (darker grey) or less (lighter grey) than proposed project. Lighter grey cell for solar insolation indicates stronger insolation.

The Harper Lake Alternative Site would have impacts to biological resources, that while different, could also be deemed significant (e.g., to desert tortoise). The development of additional solar facilities in currently remote desert locations may also change the visual character of the environment, thus creating a significant impact. Impacts to water resources, noise and traffic would be less than the proposed project. The Harper Lake Alternative Site would require both a new transmission line to Kramer substation and new lines from the substation to deliver power to load centers.

The South Carrizo Plain Alternative Sites do not substantially lessen the significant impacts associated with the proposed CESF. All three sites would cause a significant transformation of rural farm land to industrial use. However, visual impacts to discrete receptors in the area would vary depending on proximity to the site, with the North Carrizo Plain Alternative Site B, being the least visible of the three locations. Biological impacts are not substantially different from the proposed site. All three locations are considered core kit fox habitat and provide connectivity function for kit fox between the Carrizo Plain core population and other important kit fox populations. South Carrizo Alternative Site C could pose greater connectivity impacts due to its location vis-à-vis the three potential Carrizo solar projects. Noise impacts would be reduced based on proximity to receptors, with South Carrizo Plain Alternative Site B having the least impact. However, this site would have a slightly greater traffic impact, compared to the CESF and South Carrizo Plain Alternative Sites A and C. Water impacts would be similar at all South Carrizo Alternative Sites to the CESF.

The Antelope Plain Alternative Site D would lessen biological impacts, given its reduced cumulative impact to kit fox connectivity. A solar facility at this site would cause a significant transformation of rural farm land to industrial use. While there would be fewer residential viewers, there would be a greater number of highway viewers. Noise and traffic impacts would be reduced. Water impacts would be similar to the CESF. The feasibility of a project at this site is reduced as a result of Williamson Act land constraints coupled with potential difficulty in locating a 1,000 acre project (operating site plus laydown area) to maximum solar advantage. As shown in **Alternatives Figure 3**, there is fairly limited land area shown as having comparable solar insolation to the proposed site, and there is no assurance that this land could be reasonably acquired. This site is not identified in the RETI Phase 2A Report as a CREZ and construction of a

transmission line to high voltage lines at least 10 miles away could pose additional environmental impacts.

The North Carrizo Alternative Site E appears to have similar biological concerns (kit fox and pronghorn antelope) to the CESF site. Impacts to sensitive Valley Sink Scrub would be expected. A solar facility in this rural area would change the character of the land and would pose a similar significant visual impact as would the CESF. Although there would be fewer residential viewers in this location, a substantially greater number of motorists would view the facility. Noise impacts would be reduced based on proximity to receptors, as would transportation impacts. Water impacts would be similar.

Although the alternative sites pose some advantages and disadvantages, no alternative site would substantially lessen significant impacts associated with the CESF. None of the six alternative sites are considered superior to the proposed CESF site.

## **SITE FACILITY ARRANGEMENT ALTERNATIVE**

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In the proposed facility arrangement, the power block (consisting of two STGs with associated condensing and cooling systems) would be on the northern edge of the site. Staff had originally suggested that relocating the power block to a more central part of the CESF site (approximately 1,000 feet toward the center of the site) would mitigate significant operational noise to less than significant levels. Staff at this point is encouraging the applicant to consider relocating the power block to or near the center of the site, even though operational noise could be mitigated by implementation of other control measures and would comply with applicable LORS and not create significant adverse impacts. Given that staff believes implementation of the conditions of certification identified in the Noise and Vibration section of this FSA is both effective and practical regardless of the power block location, (see **Noise** section of this FSA), no site facility arrangement alternative is recommended.

## **GENERATION TECHNOLOGY ALTERNATIVES**

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### **CONSERVATION AND DEMAND SIDE MANAGEMENT**

Conservation and demand-side management consist of a variety of measures that reduce electricity use, including energy efficiency and conservation, building and appliance standards, and load management and fuel substitution. In 2005, the Energy Commission and CPUC's Energy Action Plan II declared cost-effective energy efficiency as the resource of first choice for meeting California's energy needs. Energy efficiency measures have helped flatten the state's per capita electricity use and saved consumers more than \$56 billion since 1978 (CPUC 2008). The investor-owned utilities' 2006-2008 efficiency portfolio marks the single-largest energy efficiency campaign in U.S. history, with a \$2 billion investment by California's energy ratepayers (CPUC 2008). However, with population growth, increasing demand for energy, and the need to reduce greenhouse gases, additional energy efficiency measures will be required.

The CPUC, with support from the Governor's Office, the Energy Commission, and the California Air Resources Board, among others, adopted the California Long-Term Energy Efficiency Strategy Plan for 2009 to 2020 in September 2008 (CPUC 2008). The plan is a framework for all sectors in California including industry, agriculture, large and small businesses, and households. Major goals of the plan include:

- All new residential construction will be zero net energy by 2020;
- All new commercial construction will be zero net energy by 2030;
- Heating, ventilation, and air conditioning industries will be re-shaped to deliver maximum performance systems;
- Eligible low-income customers will be able to participate in the Low Income Energy Efficiency program and will be provided with cost-effective energy efficiency measures in their residences by 2020.

Conservation and demand-side management is important for California's energy future and cost effective energy efficiency is considered as the resource of first choice for meeting California's energy needs. However, with population growth and increasing demand for energy, conservation and demand-management alone is not sufficient to address all of California's energy needs. Additionally, it will not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements; therefore technologies like solar thermal generation would be required.

## ALTERNATIVE SOLAR GENERATION TECHNOLOGIES

Staff evaluated other solar generation technologies that have been implemented for utility-scale production. The solar alternatives could achieve most of the project objectives, but would not substantially lessen or avoid environmental impacts and may require greater land use. The proposed CESF utilizes proprietary technology, which influences the economics of the proposed project. For these reasons, staff is not retaining the following technologies in this analysis:

- **Photovoltaic.** Photovoltaic (PV) facilities include both utility-scale facilities placed on the ground and distribution-scale rooftop and localized installations. Panels composed of semiconductor materials – crystalline silicon, cadmium telluride, copper indium gallium diselenide, or amorphous silicon – absorb solar radiation and convert it directly to electricity. The panels are mounted at a fixed-angle or on tracking structures. Their black surface enhances sunlight absorption and reduces glare.

Utility-scale ground-mounted PV facilities can require from 4 acres per MW (crystalline silicon) to 10 acres per MW (thin film and tracking) (NRDC and Sierra Club 2008). While water is not required for electricity generation, 2 to 10 acre feet per year (AFY) per 100 MW may be needed to wash panels, for an average of 0.6 AFY/MW (NRDC and Sierra Club 2008). The proposed 550 MW TSF is projected to use 4,100 acres of land (7.5 acres/MW) and 3.5 AFY of water (0.006 AFY/MW) during operations (Topaz Solar Farms 2008). In comparison, the CESF could generate the same capacity as TSF in about half the area, and CESF's land use efficiency is about 3.6 acres/MW. However, CESF would require about 20 times the

operational water supply as TSF, with CESF's water use efficiency at about 0.11AFY/MW.

Rooftop PV installations by their nature reduce the amount of new or disturbed land required. California's Investor-owned Utilities (IOUs) have announced significant aggregations of small-scale solar PV projects. Southern California Edison (SCE) plans to install 250 MW of solar panels on 2 square miles of commercial rooftop (in 150 installations) in the next 5 years (SCE 2008). In December 2008, SCE dedicated its first rooftop solar installation – 33,700 solar panels on a 600,000 square-foot rooftop in Fontana. In July 2008, San Diego Gas and Electric (SDG&E) proposed its Solar Energy Project, which it projects will result in up to 77 MW of new installed solar capacity in the San Diego load basin. SDG&E would build and operate 52 MW of rooftop solar and expects that customer opportunities resulting from this effort could result in the installation of up to an additional 25 MW of capacity under the California Solar Initiative (CSI) that would not have otherwise been built (SDG&E 2008). In February 2009, PG&E announced plans to develop 500 MW of solar PV projects over the next 5 years. In contrast to the SCE and SDG&E programs, PG&E would largely focus on projects from 1 to 20 MW, with ground-mounted systems, rather than rooftop panels, playing a substantial role (PG&E 2009).

A study prepared in 2007 by Navigant Consulting, Inc. (NCI) and the Energy Commission calculated the economic potential of rooftop PV, by county, for new and retrofitted buildings (NCI 2007). **ALTERNATIVES Table 2** identifies those counties with the greatest retrofit<sup>1</sup> economic potential based on the most favorable scenario using state subsidies and new business models favoring PV development.

**ALTERNATIVES Table 2**

California Counties with Greatest Economic Potential for Rooftop PV (MW)

County	2010- Residential	2010 – Commercial	2016 – Residential	2016 – Commercial
Los Angeles	16	45	85	168
San Bernardino	14	11	181	99
San Diego	3	15	23	137
Orange	11	15	71	77
Riverside	4	7	33	60
Santa Clara	4	10	22	68
Alameda	5	8	24	44

For the more southern part of the PG&E system, PV economic potential was significantly less, as shown in **ALTERNATIVES Table 3**.

<sup>1</sup> New construction economic potential was substantially less than retrofit potential.

**ALTERNATIVES Table 3**  
Economic Potential for Rooftop PV in Proximity to CESF (MW)

County	2010- Residential	2010 – Commercial	2016 – Residential	2016 – Commercial
Fresno	3	3	16	26
Kern	2	3	14	23
San Luis Obispo	2	1	26	10

In conclusion, 2016 projections for potential rooftop PV development in Kern and San Luis Obispo Counties of 37 and 36 MW respectively, would not contribute as much as CESF's 177 MW capacity in furthering development of renewable solar energy.

- **Parabolic Trough.** Each parabolic trough collector has a linear parabolic-shaped reflector (half cylinder) that focuses the sun's direct beam radiation on a linear heat collection element at the focus of the parabola. Parabolic trough technology requires approximately 4 to 5 acres per MW compared to CESF which requires about 3.6 acres per MW. A 177 MW solar field using parabolic trough technology would thus encompass 700 to 900 acres of land, resulting in a slightly greater land use and Biological Resource effects than the proposed technology.

Cooling water demands using wet cooling could be on the order of 1,060 AFY for a 177 MW plant (6 AFY/MW). Dry-cooling would only require 32 AFY for 177 MW (0.18 AFY/MW) – but has not been proposed for a parabolic trough plant in California due to economic factors (NRDC and Sierra Club 2008). Water usage for parabolic trough facilities would be 55 times greater (wet cooling) to 1.6 times greater (dry cooling) when compared to the CESF.

Visually, this technology would have comparable equipment (e.g. steam turbine-generator, cooling tower) within the power block similar to CESF and the solar field would be comprised of collectors that are approximately 30 feet high. Therefore, parabolic trough solar thermal technology would not substantially reduce or avoid significant Biological and Visual Resource impacts associated with the project.

- **Stirling Dish.** A paraboloid dish of mirrors focuses sunlight on the receiver end of a Stirling engine. A Stirling engine field requires 7 to 9 acres per MW; generation of 177 MW could thus require 2 to 2.5 times the land requirement of the CESF project which would significantly increase the effects to Biological Resources. For example, the proposed SES Solar 2 Project in Imperial County would comprise 30,000 Stirling dishes to generate 750 MW on 6,500 acres (SES Solar 2 2008). Stirling technology – with dishes 38 feet tall and 40 feet wide (in the case of SES Solar 2) – would have similar, if not greater, visual impacts than CLFR structures. Therefore, Stirling dish solar thermal technology would not substantially reduce or avoid significant Biological and Visual Resource impacts associated with the project.
- **Distributed Power Tower.** A large field of mirrors mounted on pylons (the heliostats) surrounds and focuses light on an elevated power tower. A boiler would

be supported at the top of the power tower, and power plant equipment similar to CESF (e.g. steam turbine-generator and cooling tower) would be located at ground level. The power towers would be significantly taller than the CLFR receivers and CESF power block equipment, with the tallest structure being the 115-foot high air-cooled condenser. In comparison, the proposed Ivanpah Solar Electric Generating System would consist of one to four towers for each solar field with heights from 300 to 440 feet. The heliostats making up the solar field would be approximately 20 feet high, and combined with the power towers would have significant visual effects. Also, the circular heliostat arrangement is less efficient in terms of land use; the 400 MW Ivanpah plant would require approximately 4,065 acres for solar generation (Solar Partners 2007) equating to about 10 acres per MW compared to CESF at 3.6 acres per MW, and thus would cause more significant effects to Biological Resources. Therefore, Power Tower solar thermal technology would not substantially reduce or avoid significant Biological and Visual Resource impacts associated with the project.

## ALTERNATIVE TECHNOLOGIES

Staff also considered other renewable and non-renewable energy sources. Some of the technologies – although viable in California -- would not be applicable to the Carrizo Plain. In addition, they would not meet the project objective of constructing and operating a solar power generating facility in California.

- **Wind.** Wind carries kinetic energy that can be utilized to spin the blades of a wind turbine rotor and an electrical generator, which then feeds alternating current (AC) into the utility grid. Wind turbines currently being manufactured have power ratings ranging from 250 watts to 1.8 MW (AWEA 2004). Land use requirements average 5.4 acres per MW (CEC 2008), although the turbine footprints only take 5 percent of the area (AWEA 2004). Environmental impacts include bird and bat collisions and visual pollution. The Carrizo Plain, however, has poor to marginal wind resource potential (EERE 2008) and a utility scale wind farm would not be viable.
- **Geothermal.** Steam or high-temperature water from geothermal reservoirs is harnessed to drive steam turbine/generators. Geothermal plants range in size from under 1 MW to 110 MW, and require 0.2 to 0.5 acre per MW. Geothermal plants provide highly reliable base-load power, with capacity factors from 90 to 98 percent. Plants, however, must be built near geothermal reservoir sites, as steam and hot water cannot be transported long distances without significant thermal energy loss. There are no known geothermal resources in the Carrizo Plain and surrounding areas.
- **Biomass.** Electricity is generated by burning organic fuels (feedstock) in a boiler to produce steam, which then turns a turbine. Biomass can also be converted into a fuel gas such as methane and burned. Major biomass feedstocks include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Biomass facilities do not require an extensive amount of land for the actual facility, although fuel production could require extensive acreage if specifically farmed. Biomass facilities are generally small-scale, in the range of 3 to 10 MW. There is no large feedstock source in the Carrizo Plain and surrounding

area, and ongoing truck deliveries would be required to supply the plant with biomass fuel from other locations.

- **Tidal and Wave.** Tidal generation of electricity involves building a dam, known as a barrage, across a bay or estuary. Water retained behind a dam at high tide produces a power head sufficient to generate electricity as the tide ebbs and water released from within the dam turns conventional turbines. Wave energy technologies -- which include terminator devices, point absorbers, attenuators, and overtopping devices -- extract energy from surface wave motion or subsurface pressure fluctuations (MMS 2007). These tidal and wave technologies are still in development and from a timing and location standpoint, are not a commercially-available technology and are not renewable resources available in the inland Carrizo Plain.
- **Natural Gas.** Natural gas-fired power plants typically consist of combustion turbine-generators for simple cycle peaking units and may also include heat recovery steam generators and a steam turbine-generator for combined cycle units. Additional equipment common to both simple and combined cycle plants includes wet or dry cooling towers, air inlet cooling, intermediate cooling for some gas turbines and various support equipment. An interconnection with a source of natural gas and a water connection are required. Natural gas plants emit greenhouse gases and would not contribute towards meeting AB 32 renewable energy goals in the state.
- **Nuclear.** California law currently prohibits the construction of any new nuclear power plants in California until the California Energy Commission finds that the federal government has approved and there exists a demonstrated technology for the permanent disposal of spent fuel from these facilities (CEC 2009).

## ALTERNATIVE LINEAR ROUTES AND WATER SUPPLY OPTIONS

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Transmission access and water supply from a groundwater well are within the property boundaries; therefore, analysis of alternative routes is not necessary. The proposed use of groundwater from the lower aquifer would utilize the most degraded water supply reasonably available to the project, and combined with the proposed dry cooling for steam condensation and recovery/reuse of wastewater, the project would comply with applicable LORS and policies for achieving water conservation. Please see the **Soil and Water Resources** section for more information regarding water supply and recovery of wastewater.

## THE “NO PROJECT” ALTERNATIVE

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The “no project” alternative under CEQA assumes that the project is not constructed. In the CEQA analysis, the “no project” alternative is compared to the proposed project and determined to be superior, equivalent, or inferior to it. The CEQA Guidelines state that “the purpose of describing and analyzing a “no project” alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project” (Cal. Code Regs., tit. 14, §15126.6(e)(1)). Toward that end, the “no project” analysis considers “existing conditions” and “what would be



reasonably expected to occur in the foreseeable future if the project were not approved” (Cal. Code Regs., tit. 14 §15126.6(e)(2)). CEQA Guidelines and Energy Commission regulations require consideration of the “no project” alternative. The no-action alternative is compared to the effects of the proposed action.

In short, the site-specific and direct impacts associated with the CESF would not occur at this site if the project does not go forward. If the “no project” alternative were selected, the construction and operational impacts of the CESF project would not occur. Demolition of existing buildings at the site would not occur nor would installation of new foundations, CLFR equipment, piping, and utility connections be required. There would be no significant impacts to biological and visual resources. Cumulative impacts of the CESF and proposed TSF and CVSR projects would be avoided.

In the absence of the CESF project, other power plants, including renewable facilities, could be constructed in the project area or in California to serve the demand that could be met with the CESF project. These plants could have lesser, similar or greater environmental impacts than the proposed project. In the near term, the more likely result is that existing plants, many of which use non-renewable resources, could operate more. Continuing use of fossil fuel to generate electricity contributes to greenhouse gas emissions and runs counter to California’s efforts to reduce 1990 levels of GHG emissions by 80 percent by 2050.

If the project is not built, the region and state will not benefit from the clean, renewable source of new generation that this facility would provide. PG&E would not receive a 177 MW contribution toward its requirement to procure 20 percent of its energy from renewable resources by 2010 or 33 percent by 2020. The contractual requirements of the Applicant’s expected Power Purchase Agreement would not be met. There may be substantial transmission interconnection delays associated with upgrade requirements if the project were sited elsewhere.

Considering the above, the no-action alternative is not superior to the proposed project.

## **RESPONSE TO AGENCY AND PUBLIC COMMENTS**

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**John Ruskovich Comment 1** - In comments submitted 2-19-08, John Ruskovich suggested the Lokern area as an alternative site due to its industrial nature and proximity to the California Aqueduct, I- 5, and a hazardous waste dump.

**Response to John Ruskovich 1** - The site recommended by John Ruskovich is discussed in the preceding analysis of the Lokern Alternative Site. Staff does not conclude that the Lokern site would be environmentally-preferred compared to the CESF site.

**Robin Bell Comment 1** - In comments provided 12-01-08, Robin Bell suggested considering sites a few miles to the north of the proposed site on the Carrizo Plain. Ms. Bell commented that there would be less impact on residential sites because the area

consists of larger, typically 640-acre sites. In comments provided 4-3-09, Ms. Bell also requested that Section 25 be considered as an alternative site.

**Response to Robin Bell 1** - The sites recommended by Robin Bell are discussed in the preceding analyses of the South Carrizo Plain Alternative Sites B and C. Staff does not conclude that the South Carrizo Plain Alternative Sites B and C sites would be environmentally-preferred compared to the CESF site.

**Community Environmental Council Comment 1** – In comments submitted 12-19-08, the Community Environmental Council indicated that it supported the Staff assessment that the project is preferable to another location, technology, or no project at all. However, the Council stated that the PSA did not adequately discuss the potential impacts of the project not being built.

**Response to Environmental Council 1** - This comment is addressed in the section discussing the No Project Alternative. The Community Environmental Council also encouraged the Energy Commission to examine the feasibility of installing 177 MW of rooftop solar throughout San Luis Obispo. A more detailed discussion of rooftop solar is provided in the Photovoltaic part of the Alternative Solar Generation Technologies section.

No Applicant or agency comments pertaining to Alternatives have been received.

## **CONCLUSIONS AND RECOMMENDATION**

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Staff has analyzed project site and technology alternatives, conservation measures, and the “no project” alternative. The six site alternatives retained for further analysis in this section offer some advantages, but no substantial reduction of significant environmental impacts. Staff has determined that significant impacts to biological resources would likely result from implementing a solar facility at all the alternative sites. While biological impacts could be lessened at Antelope Plain Alternative Site D, additional impacts could result from construction of a lengthy transmission line to connect to high voltage lines and the facility would be viewed by more motorists. Similarly, all alternative sites would undergo a significant transformation of rural farm land to industrial use. No alternative site is considered superior to the proposed CESF site.

Other solar technologies may require greater land or water use, and would likewise not substantially lessen environmental impacts. If rooftop PV were developed to its residential and commercial potential in Kern and San Luis Obispo Counties, it would not generate electricity comparable to the proposed project. Wind, geothermal, biomass, tidal, wave, natural gas, and nuclear facilities are not feasible alternatives. Conservation and demand side management programs would likely not meet the state’s growing electricity needs that could be served by the CESF. Although the “no project” alternative would eliminate all impacts of this project, the benefits of increasing regional and state-wide renewable energy generation would not be achieved.

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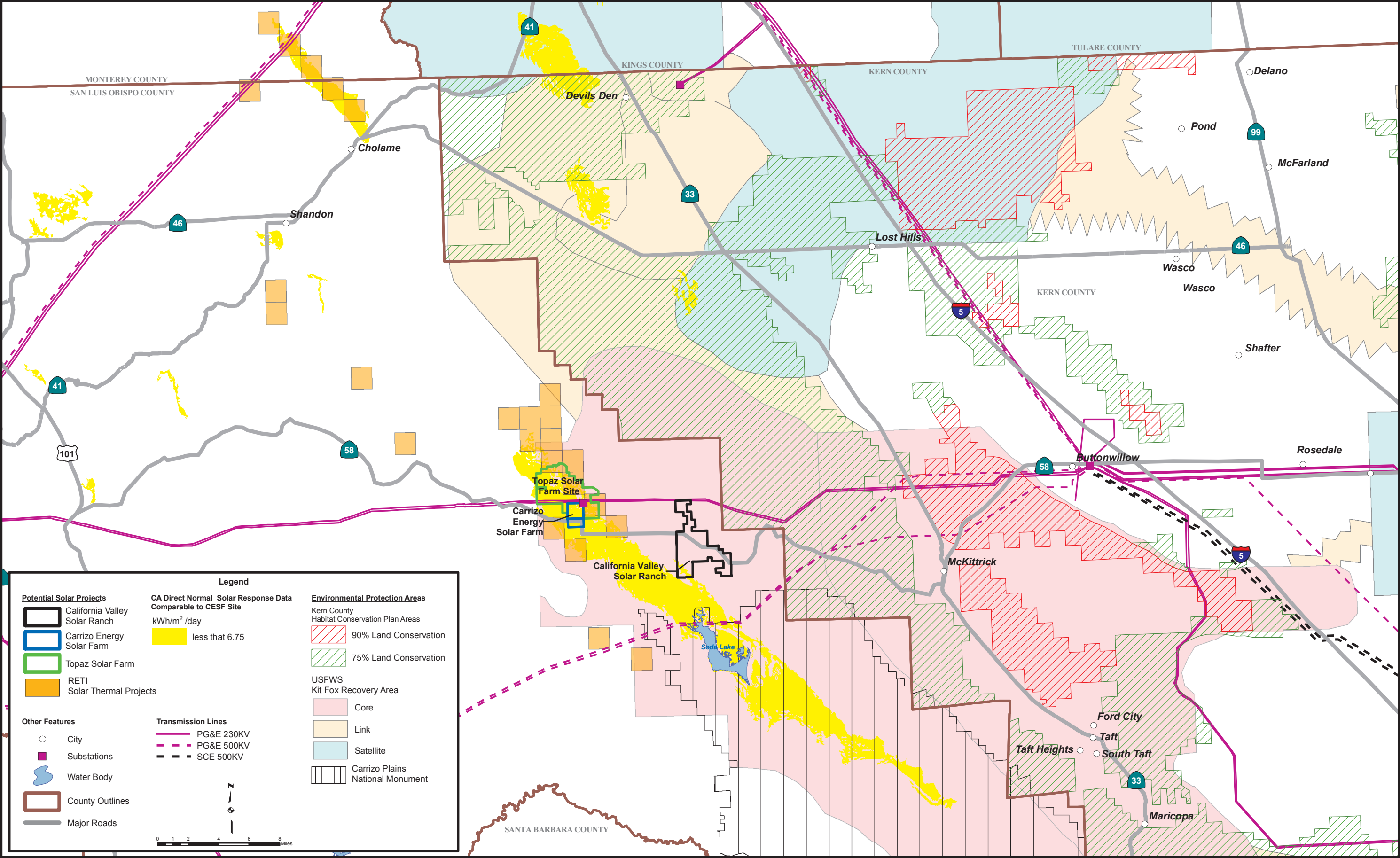
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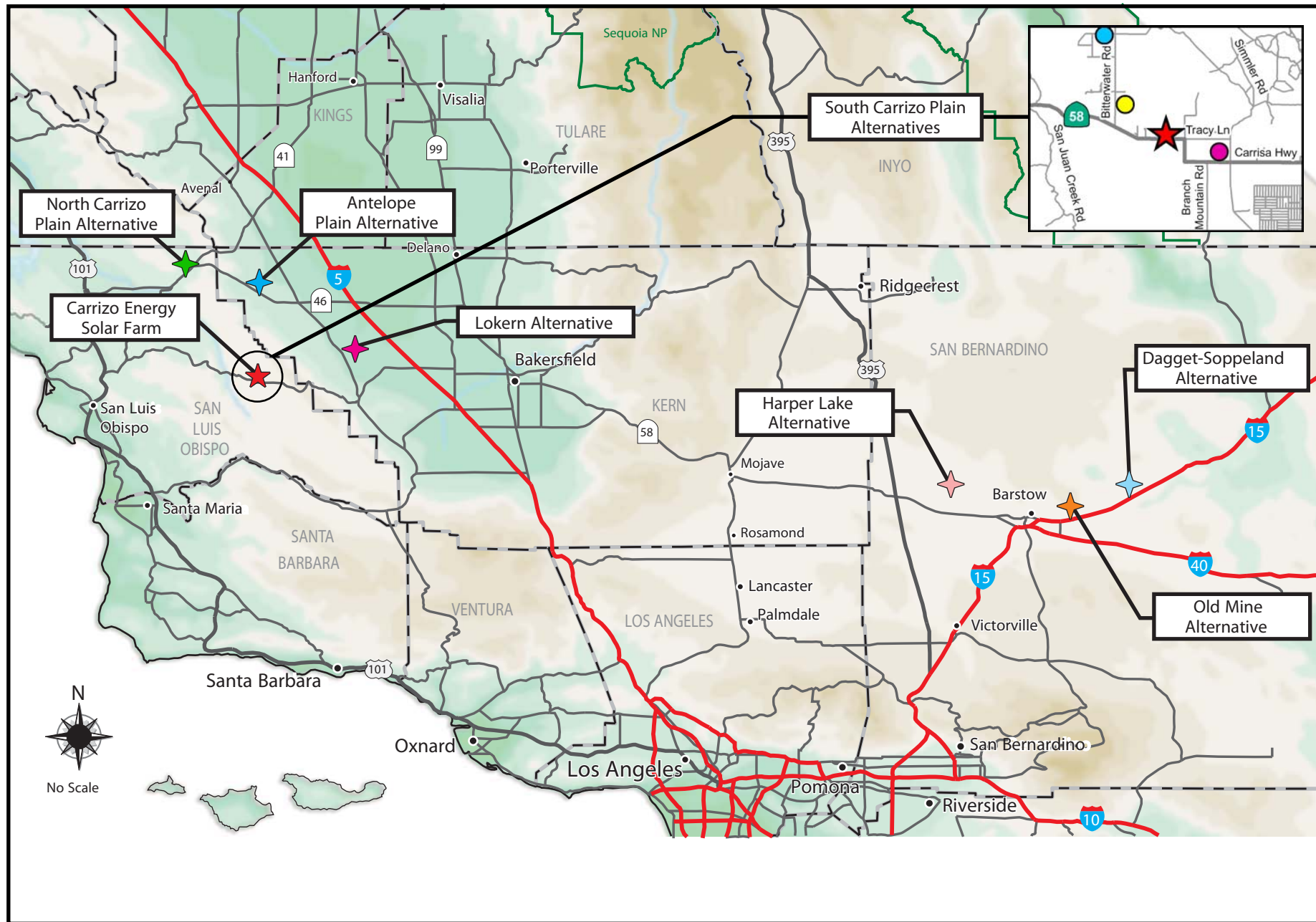
ALTERNATIVES - FIGURE 1  
Carrizo Energy Solar Farm - Alternative Site Selection Constraints



AUGUST 2009

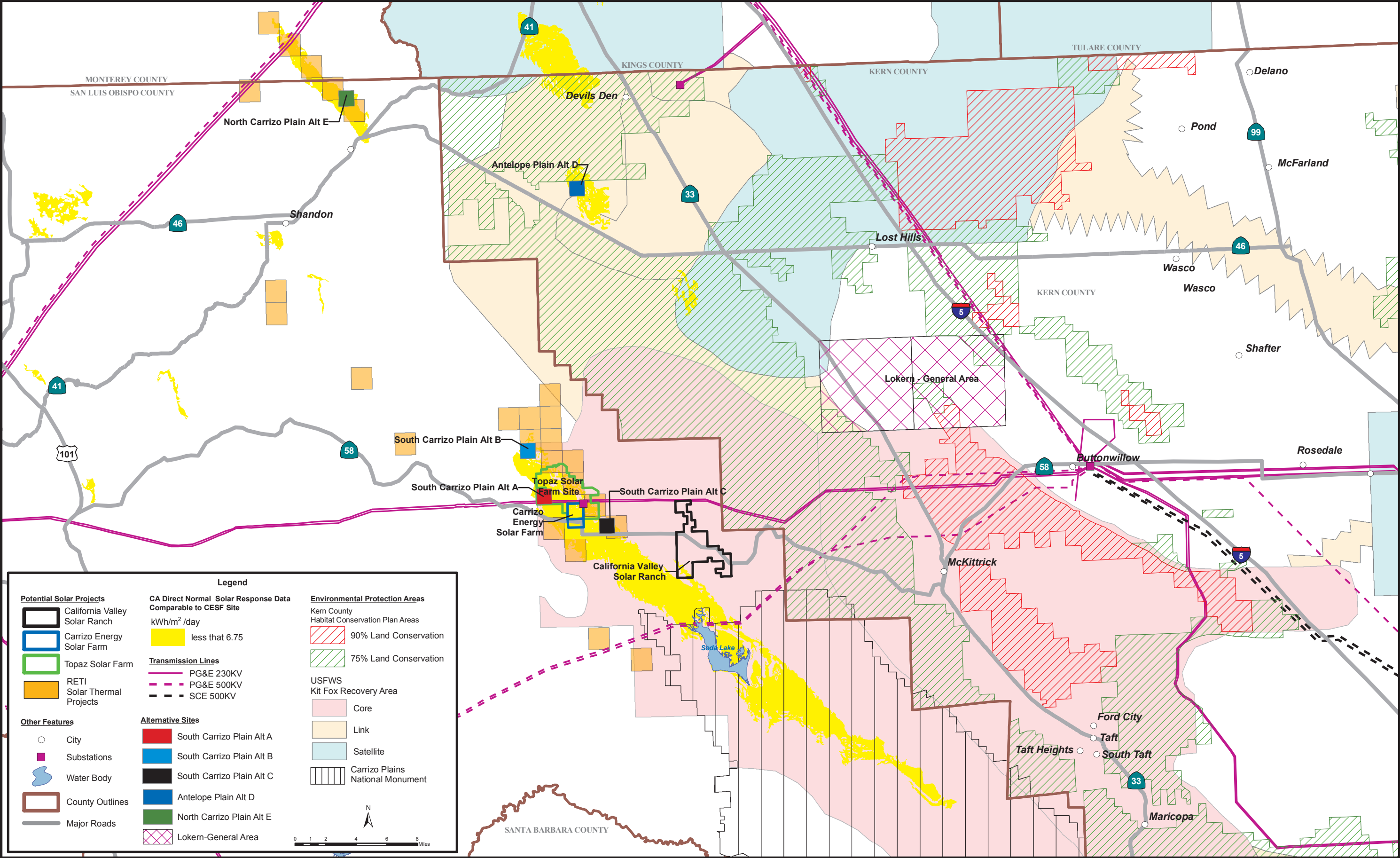
ALTERNATIVES

**ALTERNATIVES - FIGURE 2**  
Carrizo Energy Solar Farm Project - Carrizo Alternatives





ALTERNATIVES - FIGURE 3  
Carrizo Energy Solar Farm - Alternative Sites Overlaid on Constraints







**BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT  
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**APPLICATION FOR CERTIFICATION  
FOR THE CARRIZO ENERGY  
SOLAR FARM PROJECT**

**Docket No. 07-AFC-8**

**PROOF OF SERVICE  
(Revised 7/27/2009)**

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## DECLARATION OF SERVICE

I, Hilarie Anderson, declare that on August 6, 2009, I served and filed copies of the attached Draft Alternatives FSA Section, Draft Soil & Water FSA Section and Notice of Availability. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[<http://www.energy.ca.gov/sitingcases/carrizo/index.html>]**. The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

**(Check all that Apply)**

**For service to all other parties:**

  x   sent electronically to all email addresses on the Proof of Service list;

  x   by personal delivery or by depositing in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

**AND**

**For filing with the Energy Commission:**

  x   sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below **(preferred method)**;

**OR**

       depositing in the mail an original and 12 paper copies, as follows:

### **CALIFORNIA ENERGY COMMISSION**

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I declare under penalty of perjury that the foregoing is true and correct.

**Original Signature in Dockets**  
**Hilarie Anderson**